

## **CONTOUR FOR TUBE SEALS TO FACILITATE MOUNTING OF A PRODUCT EVACUATION DEVICE**

### **BACKGROUND OF THE INVENTION**

0001           The invention relates to tube packaging. More particularly, the invention relates to tube configurations that facilitate the use of devices for emptying the tube.

0002           Various systems exist that strive to facilitate the removal of a material stored in a tube. These systems usually involve some sort of device for holding a seal end of the tube while the device is twisted such that the tube is wrapped around the device. By wrapping the tube around the device, the material in the tube is forced toward an opening at the opposite end of the tube. However, many of these systems are difficult to assemble, expensive and/or not reusable.

### **SUMMARY OF THE INVENTION**

0003           The invention provides a solution to the above described problems by providing various tube seal configurations that facilitate mounting a product evacuation, or wrapping, device to the tube. The invention also provides wrapping devices appropriate for use with the various tube seal configurations.

0004           Embodiments of the invention provide a tube for containing a product to be squeezed from the tube when the tube is used in conjunction with a wrapping tool. The tube has a deformable main body for storing the product prior to the product being squeezed from the tube, the main body having a longitudinal direction, a transverse direction perpendicular to the longitudinal direction, a first

end and a second end opposite the first end in the longitudinal direction of the main body. The tube has an opening at the first end of the main body, the opening being an outlet for the product when the product is squeezed from the tube, and a seal at the second end of the main body, the seal having a contour, the contour having a bearing surface that is non-parallel to the longitudinal direction of the main body. The bearing surface is for receiving a wrapping force from the wrapping tool for wrapping the main body around the seal.

### **BRIEF DESCRIPTION OF THE DRAWINGS**

- 0005           The invention is explained below in further detail with the aid of exemplary embodiments shown in the drawings, wherein:
- 0006           Figure 1 is a front view of a first embodiment of the invention;
- 0007           Figure 2 is a side view of the embodiment shown in Figure 1;
- 0008           Figure 3 is an enlarged view of a portion of Figure 2;
- 0009           Figure 4 is a partial front view of a second embodiment of the invention;
- 0010           Figure 5 shows the interaction between a wrapping tool and the embodiment of the invention shown in Figures 1-3;
- 0011           Figure 6 shows the interaction between a wrapping tool and the embodiment shown in Figure 4;
- 0012           Figure 7 shows a partial side view of a third embodiment of the invention;
- 0013           Figure 8 shows a partial front view of the embodiment shown in Figure 7;

- 0014                Figure 9 shows a partial front view of an alternate example of the embodiment shown in Figure 7;
- 0015                Figure 10 shows a partial side view of a fourth embodiment of the invention;
- 0016                Figure 11 shows a partial front view of the embodiment shown in Figure 10;
- 0017                Figure 12 shows a partial front view of an alternate example of the embodiment shown in Figure 10;
- 0018                Figure 13 shows a partial side view of a fifth embodiment of the invention;
- 0019                Figure 14 shows a partial front view of the embodiment shown in Figure 13;
- 0020                Figure 15 shows a partial front view of an alternate example of the embodiment shown in Figure 13; and
- 0021                Figure 16 shows a partial front view of a second alternate example of the embodiment shown in Figure 13.

#### **DETAILED DESCRIPTION OF THE INVENTION**

- 0022                The invention is explained in the following with the aid of the drawings in which like reference numbers represent like elements.
- 0023                Figure 1 shows a front view of a tube 10 in accordance with a first embodiment of the invention. Tube 10 has a main body 100 that is deformable such that deformation of main body 100 causes a material stored inside tube 10 to

be expelled from an opening 210 located at a first end 200 of main body 100. A seal 300 is located at an end of main body 100 opposite opening 210. During manufacturing of tube 10, seal 300 is formed to prevent the material stored in tube 10 from exiting tube 10 from the end of main body 100 at which seal 300 is formed. A contour 310 is formed as part of, or near, seal 300. Contour 310 provides surfaces that facilitate gripping of tube 10 by a wrapping device used to squeeze the material stored in tube 10 out of opening 210. Figure 2 shows a side view of the embodiment of the invention shown in Figure 1.

0024                Figure 3 shows an enlarged view of the seal and contour area of the tube shown in Figure 2. Contour 310 in this embodiment has a trough 312 that forms bearing surfaces 314. Bearing surfaces 314 are provided to interact with a wrapping tool used to wrap main body 100 around seal 300. Although four bearing surfaces 314 are shown in Figure 3, less than all four can be used to engage the wrapping tool.

0025                Figure 4 shows a partial front view of tube 10 having a non-continuous contour 320. From this example, contour 320 is comprised of four holes 322. Each hole 322 has, in this example, two bearing surfaces 324. The example shown in Figure 4 can be considered a non-continuous version of the contour shown in Figures 1-3. Because seal 100 exists in the horizontal spaces between holes 322, holes 322 can be used instead of a plurality of small troughs.

0026                Figures 5 and 6 show the interaction of wrapping tools with the embodiments of the invention shown in Figures 1-4. Figure 5 shows a wrapping tool 20 having an upper prong 22, a lower prong 24 and a handle 26. As shown in

Figure 5, wrapping tool 20 is slid onto contour 310 of tube 10 so that upper prong 22 interacts with upper bearing surface 314 and lower prong 24 interacts with lower bearing surface 314'. Once wrapping tool 20 is fully engaged with contour 310, handle 26 can be rotated in the direction of the arrow shown in Figure 5 to twist contour 310 relative to main body 100 such that main body 100 is wrapped around contour 310. Although this example has been described such that upper prong 22 interacts with upper bearing surface 314 and lower prong 24 interacts with lower bearing surface 314', it is noted that only one of the prongs need interact with only one of the bearing surfaces during the wrapping procedure. Further, it is possible that a lower surface of lower prong 24 can interact with bearing surface 314". Figure 6 shows a wrapping tool 30 having an upper prong 32, a lower prong 34 and a handle 36. Wrapping tool 30 interacts with the example of seal 300 shown in Figure 4. Upper prong 32 of wrapping tool 30 has a number of protrusions 33 that interact with holes 322 and one or more of bearing surfaces 324. Wrapping tool 30 is moved into position such that protrusions 33 are inserted into holes 322 and then handle 36 is rotated in the direction of the arrow in Figure 6 in order to twist contour 320 such that main body 100 is wrapped around contour 320.

0027                    Although particular configurations of wrapping tools 20, 30 are shown in Figures 5 and 6, it is noted that wrapping tools of different configurations can be used to interact with the bearing surfaces shown, or other bearing surfaces, of the contours shown and described in this application.

0028                Figures 7-9 show an embodiment of the invention in which the contour is a thickened portion 330 having a bearing surface 334. Figure 7 is a partial side view of this embodiment showing bearing surface 334 located on a lower surface of thickened portion 330. Figure 8 is a partial front view shown in an example of this embodiment in which thickened portion 330 is continuous along the entire width of seal 300. Figure 9 shows a partial front view of an alternate example of the embodiment shown in Figure 7 in which the thickened portion comprises a plurality of thickened portions 330', some or all of which having a bearing surface 334'. As such, Figure 9 is a non-continuous example of the thickened portion 330 shown in Figure 8.

0029                Figures 10-12 show an embodiment of the invention in which two thickened portions 340 are provided. Figure 11 is a partial front view of the embodiment shown in Figure 10 in which both thickened portions 340 are continuous along the entire width of seal 300. Thickened portions 320 have bearing surfaces 344 located on their undersides. Figure 12 is a partial front view of an alternate example of the embodiment shown in Figures 10 and 11. In Figure 12, the contour comprises four thickened portions 340' on each side of seal 300, one or more of thickened portions 340' having a bearing surface 344'.

0030                Figures 13-16 show an embodiment of the invention having a cross shaped contour. The contour in this embodiment comprises two protrusions 350 that protrude from seal 300 a distance greater than the thickness of protrusions 350. Each protrusion 350 is shown as having a bearing surface 354 on its underside. It is noted that the upper surfaces of one or both of protrusions 350

can be serve as a bearing surface instead of, or in addition to, one or both bearing surfaces 354. Figure 14 shows a partial front view of the embodiments shown in Figure 13 in which protrusions 350 are continuous along the entire width of seal 300. Figure 15 shows an alternate example of the embodiments shown in Figure 14 in which the contour comprises four protrusions 350'. One or more of the upper and/or lower surfaces of protrusions 350' can act as bearing surface 354'. Figure 16 shows a second alternate example of the embodiment shown in Figure 14. In this example, protrusions 350", in conjunction with seal 300, form a T-shape as opposed to the cross shape formed by the protrusions shown in Figure 14 and 15. Lower surfaces of protrusions 350" are shown as bearing surfaces 354" in Figure 16. However, it is noted that the upper surfaces of protrusions 350" can act as bearing surfaces along with, or instead of, the lower surfaces of protrusions 350".

0031                While particular examples of contours in accordance with the invention have been shown in the figures, it is noted that many other configurations are possible within the scope of the invention. Further, a plurality of different wrapping tool configurations are usable with each contour configuration.

0032                The invention has been described in detail with respect to preferred embodiments and it will now be apparent from the foregoing to those skilled in the art that changes and modifications may be made without departing from the invention in its broader aspects. The invention, therefore, is intended to cover all such changes and modifications that fall within the true spirit of the invention.